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The research on performance management for new energy project oriented company based on information system in China

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ABSTRACT

The new energy industry has got more and more attention with its nature advantages. In China, the new energy projects oriented owners mainly are state-owned enterprises which usually do not have high efficiency. This study tries to provide an effective way to manage performance for projects and personnel for these companies. After research the existing achievements, we find that the project performance management is far from meeting real requirements. So we make research on performance management by analyzing the performance management demands of such companies in personnel and projects aspect and designing the performance management system based on the actual requirements. According to the idea, we build and implement the performance management information system with scores and salary calculated function, result application function and other functions for new energy project oriented company.

Contents

1. Introduction

With the rapid development of world economy, energy and environment has become urgent issue of human survival and development needed to be addressed. As main energy, fossil fuels are limited in reserves and seriously damage earth's environment

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in combustion process [1–2]. Based on considerations of primary energy depletion and environment protection, development of renewable energy has taken attention of the whole world [3]. China's twelfth five-year planning requires developing new energy industry, focusing on development of new generation of nuclear power, solar thermal utilization and solar photovoltaic power, and new energy projects have get increasingly attention of Chinese government for energy efficiency improvement [4]. In this context, new energy industry has been developing quickly, and domestic new energy projects oriented companies, independent or enterprises affiliated, began to flourish gradually [5]. In fact, most of China's new energy power projects' owner are state-owned enterprises, mainly large electric power enterprise, partly because of large initial investment, long construction period, the industrial monopoly. Previous work shows that the state-owned enterprises' (SOEs) efficiency is not that high in China [6], with half of all firms making losses as pointed out by the World Bank [7]. Especially, with empirical evidence, Andrew et al. [8] indicates that economic performance is negative within SOEs partly because of lack competition, which may lead to profitability loss and cost being out of control in new energy project. The highly regulated capital-intensive characteristics of SOEs lead to unnecessary allocative inefficiencies [9], and this make project managers lose the subjective initiative into project performance improvement without enough regulation rights and resources. Therefore it is necessary to improve SOEs' efficiency as a way of energy efficiency improvement in new energy projects. Performance management is one of effective way to overcome the efficiency problems [10].

Project performance management involves the cost, quality, schedule and other major construction and operational objectives due to extensive evaluated objects and examiners' subjectivity. Characterized with SOE, owning stated-owned new energy projects with special natures in construction and operation phases, these companies' performance management should be distinguished from the traditional way. In China, performance management has been adopted in various companies and projects, especially private enterprises. Some enterprises have obtained great success in performance improvement [11,12]. Many problems occur in the meantime, like that there is no practical way to carry out the performance management for new energy projects and to address the SOEs' inefficiency in a better way.

Although there are several publications on project performance, none of these studies focus on performance management for projects specifically. Project performance management of this study is essential for construction and operation of the new energy project, contributing to the performance management for new energy project oriented companies.

In next section, we conclude the current research situation of performance management of both project and human resources, especially for new energy project oriented company. And then, performance management demands are analyzed in Section 3 for both project and personnel, followed by Section 4 explaining the composition of the model we establish and how it works. In Section 5, we introduce a performance management information system implementing the model.

2. Current situation of the research

So far, there already exists an amount of researches on project evaluation or assessment, but mostly one or several indicators evaluation for completed construction projects or project nearing completion, such as economy evaluation and quality assessment. The current existed researches are mainly the improvements and breakthroughs of method or model in project performance evaluation. For instance, Benhai et al. [13] analyze the relationship between project organization, project characteristics and project performance system, and then construct project performance indicators and evaluation system. By improving the traditional Fuzzy Neural Network, they evaluate the project performance with a new fuzzy neural network (NFNN) method. Wang et al. [14] build performance evaluation index system for large-scale construction projects, and determine the indicators weights and the membership matter-element with fuzzy set theory and matter-element theory, and then a large scale project is assessed as an example to verify the fuzzy matter-element correctness, rationality and feasibility. Yan et al. [15] examine appraisal effects of project management through back-propagation (BP) network and establish a project management performance evaluation model under comprehensive consideration of four control indexes about project schedule, quality, cost and safety. In short, the majority of these studies including these mentioned above are focusing on methods and models of project performance evaluation index system [16,17]. Although they contributes a lot to project performance evaluation, the nature most researches is ex-post evaluation and the evaluation results can only assist companies, governments, public or other investors better understanding project condition and be the decision-making basis of next time. Therefore, there is no great significance for project management in construction or operation phrase.

In Xu' work, Based on SS curves, new parameters of cost variation (CV) and schedule variation (SV) were proposed to realize monitoring project performance, and use the simulation method to obtain cost variation at completion and the schedule variation at completion, and finally realize the forecasting of project performance [18]. It is a further development of performance management with a technical method, discussing about performance supervision and forecast, but it lack the application and guidance function of performance. In new energy industry, project performance evaluation or management mainly concentrated in the comparison and optimization of new energy scenarios, including new energy project site and type [19–21] or in the simple project performance improvement without taking the construction period into consideration [22].

We discuss the performance management for the whole lifeline of new energy project in our research, including pre-construction period, construction phrase and operation phrase. Performance evaluation contributes to better understanding of project developing condition by inspiring and regulating all the participants. The assessment results enable manager better comprehending project's actual situation on one hand, link directly to employees' wages of construction and operation phase on the other hand. As opposed to the traditional fixed salary for certain personnel in SOEs, this mechanism helps to drive the project staff work more positively and responsible.

3. Performance management demands of new energy project oriented company

Generally, a Chinese new energy project-oriented company or organization contains all the construction and operation projects with their own management offices and a headquarter where there is a permanent Project Department responsible for supervising its affiliated energy projects and other function departments like Financial Department, as shown in Fig. 1. Project Department usually concludes construction management and operation management departments working, respectively and communicating for resources allocation and information sharing. For the construction projects, a manager is designated to take the

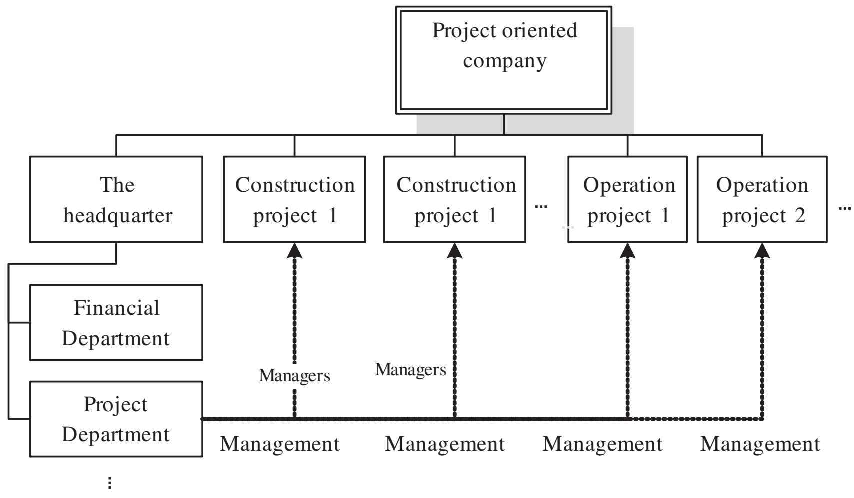


Fig. 1. Organization structure of project oriented company in China.

whole control, with several deputy manager to help in project management.

As normal companies, new energy project oriented companies need performance management for permanent personnel. On basis of previous work, Huemann et al. [23] summarized feathers of human resource management in the project-oriented company: ①Projects management as the strategy meaning the orientation of the human resources management function need to be aligned with strategy of the organization; ②Temporary nature of projects; ③Dynamism on projects size, number and personnel; ④Employee usually has multiple roles; ⑤Specific management paradigm.

In addition, with immature development, new energy projects are characterized with high-tech, high construction cost, economical operation expense and high investment risk. As new industry, new energy is under discovery with immature technologies and imperfect management mechanism. Take natural resources' nature into consideration, most new energy power generation projects cannot offer steady and continuous electricity and are usually full of potential affecting factors and possible change elements, making the real-time evaluation and treatment important. As for new energy projects-oriented companies, they usually have more than one new energy project at a time, which are different in size, profitability, policy attitudes, risk factors and different energy type (wind power, solar energy, biomass power, etc.). It should be noticed that energy projects of one type of energy share the most characteristics which must be focused on as the evaluated objects. Therefore, the evaluation indicators for these projects must be differed from each other according to energy type. Thence we propose to design different index systems for different projects. In addition, because of the policy supporting measures like tax concessions, these companies do not need to put too much attention into promoting the sales of the product, the power. As a result, how to improve the performance is an important requirement from the perspective of both the company itself and the government. Based on the situation, we summarize the following relating demands.

3.1. Performance appraisal demand of permanent personnel

First, it is needed to access performance of permanent personnel within a project oriented company and inform employees of result. Staff first evaluates his own performance with his direct manager verifying the scores, which is required to ensure the truthful self-evaluation. Then, it is the manger's turn to give the impression about the staff performance and finish the evaluation so as to assess the real contribution the staff has made to the organization from a high level. Ultimately, both sides' results shall come down to form the final performance result. Besides, every staff must be able to inquire his own current and historical performance, while managers shall be capable of knowing every subordinate's working achievements. On the basis, a manager may make decisions on the treatment for the subordinate, like rewarding, punishing or guiding.

As a conventional assessment, performance appraisal is implemented in both monthly and yearly way according to the empirical practice. In addition, in case an administrator may make judges with inappropriate subjectivity and the staff may disagree with the result, he (she) must be able to appeal against the existed scores within a particular period.

3.2. Performance evaluation demand of project

From the company or organization deciding to construct a project to operation stage, the whole life of project can be divided into four periods, as followed.

In planning period, company makes preparation including approval procedures like feasibility report, and preliminary work like field preparation. These works are procedural, official, form-particular and sometimes convenient for field construction, as a result of what, the performance is hard to evaluate quantitatively. Therefore, the evaluation of this period can perform in a subjective and qualitative way, according to the satisfaction degree of company leaders about these project works. The evaluation would be made several times in the period as requires in practical, basic ones including the time when a project is finally approved to build and when the field preparation is finished. Furthermore, high-tech energy projects do not have clear boundary line from design to build, so we do not distinguish in time.

In construction period, it is crucial to make well control of five regular goals, cost, progress, quality, safety and environment. Generally speaking, the performance management work of this period aims at realizing the real-time performance evaluation and application. Taking the long construction time into account, it is intended project performance shall be checked each month to grasp the real-time situation and help striking out what would be appropriate to do in the next month. As for the evaluated objects, a large range of detailed performance indicators are required to make the comprehensive assessment in real-time way.

After completion of project, the investors and company would like to get inform of how the project satisfies them. So, it is time for one comprehensive evaluation to be accomplished from the whole project perspective, goal of which is to verify whether a finished energy project meets the origin demands.

When it comes to operation period, projects tend to become more stable with relatively fixed personnel and works contents. Moreover, as the new energy project, the operation phase only requires regular or irregular maintenance. The performance of operation project can be accessed by evaluating the staff's daily work. So the performance management is similar to permanent company personnel, with the evaluation made monthly and yearly.

All the above periods' evaluations are consist of two processes, which are project managers' self-evaluation and company leader's leadership evaluation. As for appeal system, the part is similar to permanent personnel with project managers being capable to appeal against company leader's opinion. Moreover, it is necessary to take project information security in consideration.

3.3. *Office and system demand of performance management*

Project oriented company always have several different projects in different period which must allow to be schedule-updated, fundamental information-shared and new project-added. Furthermore, assessment results should be taken into use for developing better project by performance wage payment, which means salary must be partly decided by performance.

As a complete MIS, performance management system has other system demand such as account management and convenience of usage.

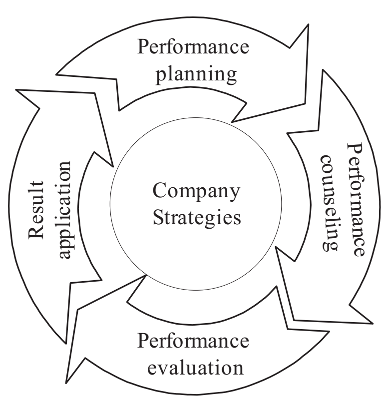


Fig. 2. General performance management process.

4. Performance management model

As shown in Fig. 2, the traditional performance management achievement covers four steps, which are performance planning, performance counseling, performance evaluation and the results application [24]. To make performance plan in line with company strategy and to determine assessment indicators, the first step is needed. The counseling step helps personnel know more about what his working target is. As a core, the third step should be finished with a complete model where performance scores can be calculated. According to the result, administrators make their decision on whether and how to adjust plans.

4.1. *Indicator system*

The indicator system includes indicators for both personnel and project. Here we take a new energy company in China as an example.

(1) One index system aims at permanent company staffs and every employee has his distinctive indicators system differing from others due to his particular work content, which means there is no large changes for the index system no matter how many projects there are or what the projects are, except that his work content or duty changes. The reason of the design is that project oriented company headquarter do not have many positions in usual, but each one take a comprehensive and overall work with a completely unique work content from each other. These personnel indicators can be divided into two empirical classifications, the task performance and management performance [25]. Accordingly, the structure of performance evaluation indicators systems for personnel of the whole company is shown in Fig. 3, where each large frame composed of three smaller frames represents an index system for a certain position and the solid lines represent the organization relationships of superiors and subordinates.
Taking contract management position of construction management department in the example company as example, according to the post responsibilities manual, the position mainly performs contracts drafting and reviewing, contracts records management, meeting minutes collating and delivery, contract information filing, relating materials' sending and receiving work and contract performance monitoring. Accordingly, we construct the indicators system for the position, as listed in Table 1. The last indicator in the table—re-approval rate is used to make a constraint on personnel for random score. Due to the space constraints, this paper does not list the whole indicators systems of all the personnel since specific

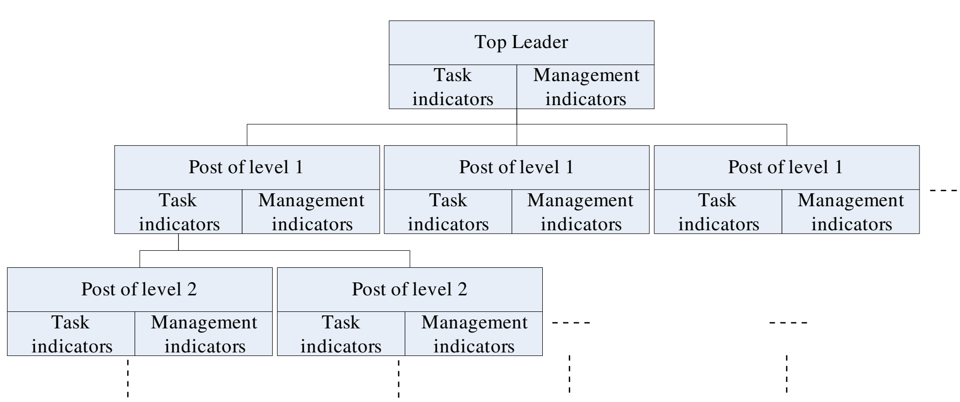


Fig. 3. Structure of performance indicators systems for personnel of the whole company.

Table 1
Performance indicators for contracts management post in a Chinese new energy company.

Classification	Indicators	Description	Evaluation frequency	Relative scores
Task performance	Work legality	How do drafted contracts compliance with the law of government and company	Yearly	20
	Contracts preparation conditions	Integrity of tender and bidding documents preparation without delay	Yearly	25
	Integrity of contracts information collection	The integrity condition of collecting and collating contract negotiations' raw data information	Yearly	20
	Contracts performance monitoring power	Monitoring degree for contracts performance	Monthly	30
	Betimes of meeting minutes collation and delivery	Condition of delivery of collated meeting minutes in time	Monthly	15
Management performance	Professional skills	Whether the staff could meet job requirements and finish his own work	Monthly	10
	Learning ability	Whether to grasp new law knowledge about contract preparation quickly and effectively	Monthly yearly	10
	Innovation ability	Whether the staff can put forward system, approach, amendments complying with company creatively	Yearly	10
	Emergency response ability	Whether the staff has ability to deal with contract disputes	Monthly yearly	5
	negotiation ability	Whether the staff has ability to negotiate with other companies	Monthly yearly	10
	Subjection to work arrangements	Subjection degree to orders from superiors	Monthly	5
	Enthusiasm degree	Positive degree of work	Monthly	5
	Cautious degree	Cautious degree in contract preparation	Monthly	5
	Re-approval rate	Re-approval condition	Monthly	5

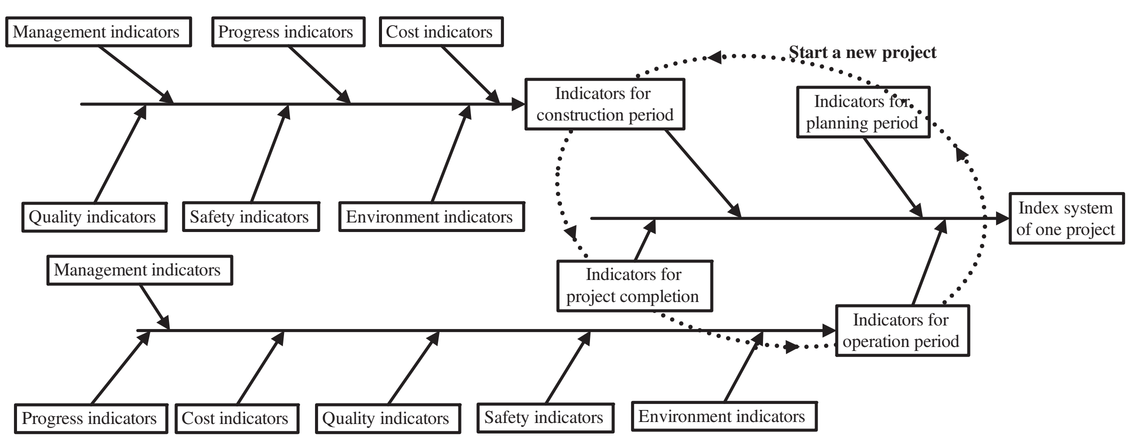


Fig. 4. Performance index system structure of one project.

company has its own particular organization structure with personnel taking the corresponding responsibilities. Similarly, we would only list one project indicator system in the next paragraph because of the limited space.

(2) The other is for the purpose of new energy project evaluation. Currently, project management is mainly on basis of five targets achievements, quality, schedule, cost, security and environment []. Different projects are of different constructing and operating targets, therefore constructing indicators according to project type would be appropriate because of the great similarities of same kind of energy application. The Fig. 4 shows the performance index system structure of one project, where solid lines signify the composition relations and dotted line means the life cycle of projects process. It should be noted that, the cycle is for a project oriented company rather than for a single project, each time starting with a new project's planning period and ending when it comes to the operation stage, then continuing planning for another project. The index system of each project consists of the whole four indicators systems for project performance evaluation, which are indicators for period of planning, construction, completion and operation.

As for the new energy company mentioned above, its energy projects include solar power projects, wind power projects and nuclear power projects. Accordingly, three sets of index systems are needed to be established distinctly for the three types of energy projects. Here we take wind power project as example, construct and list the evaluation indicators for construction period. The same as Fig. 4, indicators are sorted by five targets as well as management performance indicators. Set up on basis of the company wind power generation engineering project

acceptance regulations, the index system is shown in Table 2. The index system is not that perfect to fulfill requirements of all the wind power projects, which should be made adjustments for each specific project.

On one hand, all the projects' construction and operation contexts and personnel work contents may change at all time, on the other hand, after the company perform its performance application, there may be something unreasonable or not adapting

Table 2
Project performance indicators of construction period in a new energy company.

Classification	Indicators	Description
Quality indicators	Generators' foundation engineering installation condition	How does generators' foundation engineering installation condition meet criteria of acceptance regulation
	Generators installation condition for generators	How does generators installation condition meet criteria of acceptance regulation
	Monitoring system installation condition for generators	How does generators' monitoring system installation condition meet criteria of acceptance regulation
	Tower frame installation condition for generators	How does tower frame installation condition meet criteria of acceptance regulation
	Cable devices installation condition for generators	How does generators' cable devices installation condition meet criteria of acceptance regulation
	Box-type transformer installation condition for generators	How does generators' box-type transformer installation condition meet criteria of acceptance regulation
	Lightning-proof Grounding devices network installation condition for generators	How does generators' Lightning-proof Grounding devices network installation condition meet criteria of acceptance regulation
	Main transformer installation condition for booster station	How does main transformer installation condition meet criteria of acceptance regulation
	High and low voltage electrical equipments installation condition for booster station	How does high and low voltage electrical equipments installation condition meet criteria of acceptance regulation
	Enclosure and secondary circuit connection installation condition for booster station	How does enclosure and secondary circuit connection installation condition meet criteria of acceptance regulation
	Bus devices installation condition for booster station	How does bus devices installation condition meet criteria of acceptance regulation
	Cable devices installation condition for booster station	How does cable devices installation condition meet criteria of acceptance regulation
	Low voltage distribution equipments installation condition for booster station	How does low voltage distribution equipments installation condition meet criteria of acceptance regulation
	Lightning-proof Grounding devices installation condition for booster station	How does Lightning-proof Grounding device installation meet criteria of acceptance regulation
	Power lines condition within farm	How does power lines with the farm meet criteria of acceptance regulation
	Booster station and control building construction condition	How does booster station and control building construction meet criteria of acceptance regulation
	Transportation engineering condition	How does transportation engineering construction meet criteria of acceptance regulation
Schedule indicators	Construction preparation completion rate	$\frac{\text{Actual amount of construction preparation}}{\text{Panned amount of onstruction preparation}} \times 100\%$
	Traffic engineering completion rate within farm	$\frac{\text{Actual amount of traffic engineering}}{\text{Panned amount of traffic engineering}} \times 100\%$
	Booster station and control building construction completion rate	$\frac{\text{Actual amount of booster station and control building}}{\text{Panned amount of booster station and control building}} \times 100\%$
	Power lines completion rate within farm	$\frac{\text{Actual amount of power lines installed}}{\text{Panned amount of power lines}} \times 100\%$
	Completion condition of generators installation	The number of wind power generators installed
	Electrical equipments installation and debugging work completion rate	$\frac{\text{Actual amount of installation and debugging}}{\text{Panned amount of installation and debugging}} \times 100\%$
	Generators foundation engineering completion rate	$\frac{\text{Actual number of power generation projects}}{\text{Panned number of power generation projects}} \times 100\%$
Environment indicators	Effects on acoustic environment	Effects of construction noise on residents within 200 m
	Effects on water environment	Effects of wastewater appeared in construction period on surrounding water quality
	Effects on air environment	Effects of fugitive dust appeared in construction period on surrounding air quality
	Influences of solid waste	Influence condition of solid waste such as remaining earthwork and construction waste
Environment indicators	Effects on ecological environment	The destruction of the original vegetation changes in surface morphology in construction period
Security indicators	Occurrence of major safety accidents	Occurrence number of major safety accidents in construction period
	Supervision and inspection condition of civilized construction	Betimes of supervision and inspection of civilized construction at construction site
	Safety education condition for construction workers	Betimes of safety education for construction workers
	Protection condition of hygiene health for construction workers	Betimes of protection of hygiene health for construction workers
	Construction machinery and equipment inspection	Betimes of construction machinery and equipment inspection
	Fire device inspection	Betimes of fire device inspection
Cost indicators	Engineering budget achievement rate	(actual cost of the projec/planned project budget) $\times$ 100%
	Cost settlement	Betimes of monthly engineering cost settlement
Management performance indicators	Staff satisfaction	Average value of staff' satisfaction about their department
	Professional skills	How do personnel grasp professional knowledge
	Learning ability	How do personnel learn new knowledge
	Initiative	Initiative to help workmates finishing work
	Collaborative ability	Collaborate with workmate to finish a job
	Discipline	Whether to obey job standards and staff rules
	Responsibility	How is personnel responsible for his work

to company strategy. Therefore, it must be convenient to adjust all these indicators.

4.2. Performance score and salary

4.2.1. Performance score calculating model

There are various kinds of existed evaluation methods, like Topsis (the technique for order preference by similar to ideal solution), Electre and its expanded methods, Promethee and its expanded methods, AHP (Analytic hierarchy process) and its expanded methods et al. [26]. In our research, even though the system is complicated and integrated, the evaluation need not be that complex. The performance score is calculated in a simple way with linear comprehensive evaluation method, where the final score is the weighted sum of all the indicators. As shown in Eq. (1), where there are n indicators for personnel in total, w_i represents weight of indicator i and r_i denotes the score of indicator i marked by some particular staff. The evaluation method is chosen because it is intuitive, fundamental and easy for further research and expansion.

$$\text{final score} = \sum_{i=0}^{n} w_i \times r_i \tag{1}$$

According to this principle, both of the permanent personnel and project performance result can be calculated as *perp* and *prop*, which are shown as follows:

$$perp = w_1 \times \sum_{i=1}^{n} w_{self-i} \times r_{self-i} + w_2 \times \sum_{i=1}^{n} w_{leader-i} \times r_{leader-i} \tag{2}$$

$$prop = \sum_{k=1}^{num} w_k \times \left(\sum_{j=1}^{m} w_{pm-j} \times r_{(pm-j)(k)} \right) + w_4 \times \sum_{j=1}^{m} w_{leader-j} \times r_{leader-j} \tag{3}$$

where there are m indicators for project in some period and *num* managers manage the whole project; *perp* denotes a staff performance result of one month or year and prop denotes a project performance result of the period, while w_1 and w_2 represents importance (or weight) of personnel self-evaluation and his leader's evaluation, while w_k and w_4 the weight of project manager k evaluation and company leader evaluation; w_{self-i} and r_{self-i} denotes weight and marks of indicator i in self-evaluation, while w_{pm-j} denotes weight of indicator j, and $r_{(pm-j)(k)}$ denotes score of indicator j marked by project manager k; $w_{leader-i}$ and $r_{leader-i}$ denotes weight and score of indicator i in leader-evaluation, while $w_{leader-j}$ and $r_{leader-j}$ denotes weight and score of indicator j in company leader's evaluation for project.

Project managers and company leader should mark the project indicators according to the real situation of the project in some period.

4.2.2. Salary calculating model

Salary is a directive tool to encourage staff improving his work. Thus, performance results must be associated with salary as the directive and effective performance application method.

In our research, we define the salary the sum of basic part and performance part, as shown as follows. Here *bs* means basic salary, which will be paid to staff however the he (she) does his job; k_{per} and k_{proi} represents the performance salary part coefficient of personnel and project i, set according to a specific company demands; *de* is 0 if salary owner does not participate in any project, and is equal to 1 if he (she) takes part in one or more project; np represents the projects number salary owner has participated in.

$$\text{staff salary} = bs + k_{per} \times perp + de \times \sum_{i} (k_{proi} \times prop_i), i = 1,2 \cdots np \tag{4}$$

5. Design and implementation of performance management system

With the whole frame of performance management discussed in Section 3 and indicators system, performance score and salary calculated methods in Section 4, a corresponding information management system can be established to integrate all the theories and put them into practice. The performance management system consists of four modules in total. The general structure is shown in Fig. 5, where it is obviously that the system includes only the third and the fourth steps of the general performance management process discussed in beginning of Section 4. This is because performance planning and counseling procedures are too subjective and easily human impacted to realize in a machinery information system. We suggest the works of two first steps performed in the reality outside the system before the performance evaluation and after the result application, as researched in many studies [27,28], and we would not describe in detail in this paper.

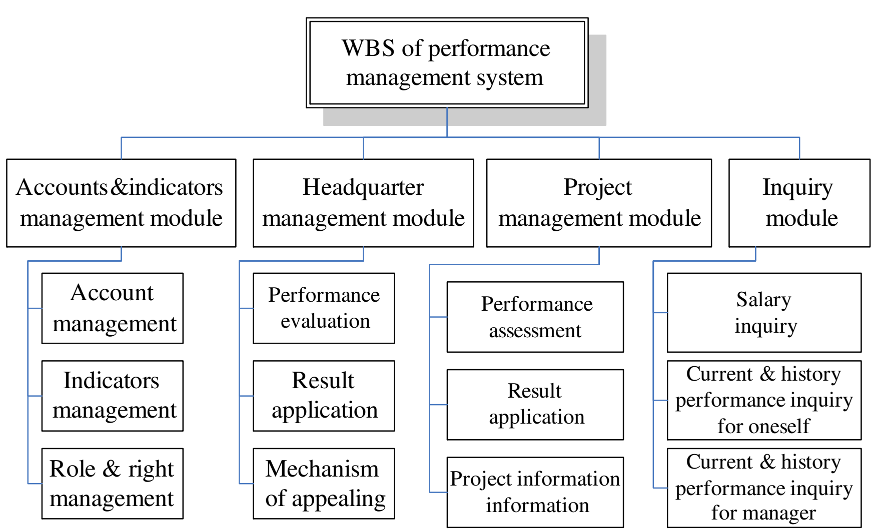


Fig. 5. Modules structure of WBS of performance management system.

5.1. Accounts and indicators management module

As an integrated and dynastic system, it must allow changing, deleting and adding an account, the only authentication way for users to sign in. System administer or other user with a particular right could edit all the accounts information and all users can make changes to his own account data, including account ID and password.

Another important aspect of the system is the indicator system management. Some specific user inputs the completed indicator systems, including that for projects and for single staff. With the assessment results application, every single indicator could be abandoned, replaced or weight updated. Before the system put into use for a new project, the personnel and project indicators designed in Section 4.1 shall be input into the system first.

Understand consideration of the personnel changes, system administer should perform role management; he (she) should be able to add or delete a job position according to requirements. The position information contains direct leader who would complete the its leader evaluation, department, the distinctive indicators system, the post's primary salary and performance salary coefficient and job description.

In addition, the system administrator must input the salary and performance scores calculating formula and all the coefficients. These coefficients and formulas can be changes if it is needed.

5.2. Headquarter management module

This module is used for performance management of permanent personnel, which can be divided into two parts.

One is performance evaluation. According to the permanent personnel performance appraisal demands analysis in Section 3.1, the evaluation shall combines self-evaluation and leader evaluation monthly and yearly. The whole process starts from the staff assesses his (her) performance of that period by his (her) indicators system. Then the direct leader make approval check to make sure the self-evaluation accords with the reality. Once the self-evaluation passes approval, scores cannot be changed; on the contrary, the personnel should give scores to his indicators again and again until the final approval. The leader needs to accomplish his (her) evaluation for all the subordinates. After then, with the calculating formula input in the first module, a final performance result of this period would be calculated automatically by the system, based on the performance score calculating model built in first part of Section 4.2 with Eq. (1). Both monthly and yearly performance assessment are implemented in this way. All these operations have their prescriptive time requirements. For example, March performance assessment should be completed in time between April 5 and April 8, and yearly performance assessment is limited in the next January. Certainly, if a staff does not satisfy his leader's evaluation about him, he is access to appeal to the higher lever manger for a scores modification.

The other is result application, in which the assessment results will be analyzed by mangers and discussed by employees to judge if the indicators and targets are positive drive to development of both company and personnel. At the same time, after knowing the subordinates' work condition with the result, managers could make right punishment, reward or other decisions.

5.3. Project management module

Similar to last module, it also include two parts, assessment part and result application part, the content of the latter resembles headquarter management to great extent.

As for the former part, the assessment is composed of project mangers' evaluation and company leader's evaluation as analyzed in Section 3.2, just like personnel performance part. But the evaluation mode is different, where in pre-construction period and at completion point, there are only one or certain times of evaluation for each situation, and they have no contribution to this project index system improvement, but help in indicators optimization for the next same-type project. During the construction phrase, the assessment will be performed every month, like the staff performance appraisal, only that there is no yearly assessment. Whenever the project managers or company leader find that the existed indicators are inappropriate, unreasonable unpractical or benefit-little for the future months of project construction, a discussion meeting about the construction indicators promotion shall be held. System administrator would be informed to make the necessary modification. In operation phrase, the assessment will be performed every month and every year exactly like headquarter does. All the assessment scores would be recorded in the system and with the scores calculating model discussed in Section 4.2, a final score of the certain period would be calculated.

Actually, project information should be edited first by a specific user. The user need to add a project with its type (wind power, solar power et al.) for linking to a appropriate indicator system, project managers and company leader who is in charge of the project for project evaluation, relating coefficients, project description and other necessary project data. With a project making progress day by day, once a phrase ends or another phrase starts, the user should update the project schedule as well.

5.4. Inquiry module

In this module, every system user should be capable of inquiring his performance results of current or history periods and view the salary information including primary part and performance part. Moreover, manger must have the rights to inquire all the subordinates' performance results of current and history periods.

5.5. System application assurance

The management system is designed for performance management for new energy project orientated companies. With the system, performance can be observed and improved. To guarantee Chinese new energy project orientated companies, as SOE, to take long-term measures for efficiency enhancement such like apply the information system designed, the corresponding regulations and policies must be supportive. A definite rule from the policy level is needed to require these companies take obligations for performance improvement. Once the system put into practical application, contrast between the before and after system application is needed for future promotion. The parent enterprises of these companies shall record how the improvement is, respectively. For those that make great progress, public praise within the enterprise can be taken accompanying with material rewarding for the whole company like and salary and welfare ascension to some extent; praise in the whole society which may lead to the high reputation.

6. Conclusions

The dynamic performance management system for new energy project oriented companies we design in the research can achieve the performance management of both permanent personnel in company headquarter and new energy projects. Staff performance assessment is realized and performed on basis of distinctive indicators system of particular personnel. Project

performance evaluation is implemented according to different index systems for different types of energy projects, which are designed in view of project periods. All the indicators could be changed at any time to comply with the reality and requirements, meaning the evaluation results are applied for better developing the company.

In general, the system cannot only meet the traditional staff and project performance management, but also associate the project performance with five project management targets. And unlike most of existed researches focusing on ex-post evaluation of projects, project performance management in this study is performed together with the project establishment throughout the whole lifeline. As a result, the research has both theoretical and practical values, especially the practical application value. Authors believe that the research result can be used by Chinese new energy project-orientated companies for better performance management, and meanwhile, the research also provide reference value for new energy project-orientated companies in other countries and regions, especially developing countries.

However there are still unsolved problems existed in the system. For instance, the performance result calculating model such as DEA models, including CCR, BCC and FDH can be developed to shed new light on the operational efficiency and determinants of state-owned enterprises and the system can be integrated with other management software including financial software and collaboration platform for intelligent management. The improvement of the system will be authors' next work.

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